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RESEARCH NOTE RM- 240

## ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

### Sagebrush Control with Herbicide Has Little Effect on Elk Calving Behavior

A. Lorin Ward<sup>1</sup>

Elk did not change their calving behavior or feeding habits on a site where 96.7 percent of the big sagebrush (*Artemisia tridentata*) cover had been killed with 2 pounds acid equivalent of 2,4-D herbicide.

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Elk (*Cervus canadensis*) have their calves on big sagebrush (*Artemisia tridentata*) sites on some ranges (Altmann 1952, Anderson 1954, Eustace 1967, King 1964, Madson 1966). It has also been reported that calving takes place in other vegetation types such as grasslands, willows, aspen, and conifers (Altmann 1952, Mackie 1970, Madson 1966, Picton 1960, Preble 1911). Many of the big sagebrush areas are heavily grazed by elk during winter and spring, and by cattle during the summer. To increase food supplies and improve range conditions for livestock, range managers often seek to kill the sagebrush on these areas. The question of how sagebrush control may affect elk calving behavior has not been answered.

Sagebrush control, an accepted range-improvement practice for many years, has been

successful on 5 to 6 million acres throughout the West and in the past 30 years (Pechanec et al 1965). The USDA Forest Service and USDI Bureau of Land Management sprayed about 155,000 acres of sagebrush on lands under their administration in Wyoming from 1952 through 1964 (Kearl and Brannan 1967).

Wilbert (1963) concluded from animal sightings and pellet-group counts that sprayed sagebrush plots were more attractive to elk than unsprayed plots on the Gros Ventre elk spring range in Teton County, Wyoming. How calving might have been affected by sagebrush control was not mentioned.

The study reported here was conducted in the Dry Fork drainage of the Little Bighorn River on the Bighorn National Forest in Wyoming, from 1968-71. The objective was to determine whether sagebrush control with herbicide on relatively small areas would affect established elk calving behavior. The study area had a southwest aspect; vegetation was a mixture of forbs, grasses, and big sagebrush. Elevation of the area is 7,300 feet. Elk activity on the area was observed from the west side of Dry Fork in Bull Elk Park (fig. 1).

<sup>1</sup>Principal Wildlife Biologist, Rocky Mountain Forest and Range Experiment Station, with central headquarters at Fort Collins, in cooperation with Colorado State University. Research reported here was conducted at the Station's Research Work Unit at Laramie, in cooperation with the University of Wyoming.

Figure 1.—

Study area on Dry Fork, Bighorn National Forest, Wyoming, looking toward sagebrush-control areas (dotted lines) with southwest aspect.





The Dry Fork flows northwest between Bull Elk Park and the study site. Elk move to this area in the spring during the calving season from the Kern's winter elk pasture on the east side of the Big Horn Mountains. The date the elk are able to get there and how long they stay depends upon the amount of snow and the weather. As the vegetation in the higher country develops, the elk move on to the west. Only a few elk are seen in this area during the summer. The main herds pass through this area in the fall on their way to the winter pasture.

### Methods

Two areas, one 85 acres and another 45 acres, were sprayed by helicopter with 2 pounds acid equivalent per acre of 2,4-D herbicide after the elk calving season (mid-June) in 1969. Only the more gentle slopes and areas away from trees were sprayed. Considerable acreage of sagebrush type remained between and around the sprayed areas.

The calving sites were observed from a remote vantage point with telescopes and cameras for 2 years before spraying and 2 years after spraying.

The total number of hours that adult elk, elk calves, and mule deer were on the study area was obtained each year for the sprayed and nonsprayed areas.<sup>2</sup> The first pretreatment observation period (1968) began May 31, and continued until July 7. Observations the second pretreatment year (1969) covered a 10-day period from May 29 to June 8. Posttreatment data covered the period June 10 to 15, 1970, and June 3 to 11, 1971. A very heavy snowpack and a late spring in 1970 delayed elk reaching Dry Fork.

Locations of adult elk and elk calves and their grazing patterns were observed and plotted twice daily on aerial photographs. First observations began at daylight and continued for about 3 hours; the second period began at 6 p.m. At the beginning of each observation period all animals that could be seen were recorded. Their travels were followed and any new animals were added as they appeared. In many cases, elk calves could not be seen until they got to their feet when their mothers approached. The area was observed periodically during the middle of the day to record any elk activities and continued until dark. Occasionally observations were interrupted by poor visibility.

<sup>2</sup>Observation data from Bull Elk Park were collected in 1968 by USDA Forest Service employees Bob Joslin, Dale Morris, and the author. In 1969, 1970, and 1971, Marvin Hawley, Bob Williams, and Mac Black of the Wyoming Game and Fish Commission worked with the author to collect the data.

Vegetation composition was estimated before and after spraying by the step-point method (Evans and Love 1957). These data provided an estimate of the kill of big sagebrush and forbs on the treated sites.

At least 20 fresh elk fecal droppings were collected on the study area every year soon after observation data were taken. Droppings were examined by microtechniques described by Ward (1970) to identify graminoids, forbs, sagebrush, and other browse eaten by elk.

### Results

Spraying significantly changed vegetation composition (percent hits):

	1969 (before spraying)	1970 (after spraying)
Graminoids	46.5	64.1
Forbs	44.2	25.6
Live shrubs		
Sagebrush	8.3	0.5
Other browse	1.0	1.1
Sagebrush cover	33.5	1.1
Dead shrubs		
Sagebrush	0.0	8.7
Other browse	0.0	0.0
Sagebrush cover	0.0	32.4

The herbicide killed 94.7 percent of the sagebrush plants, which reduced sagebrush cover 96.7 percent. After spraying, hits on graminoids increased 17.6 percent, and decreased on forbs 20.6 percent.

### Food Habits

Fecal droppings at this time of the year are very soft, high in moisture content, and rapidly dispersed. The samples collected in 1970 and 1971 reflect little change in the percentage of graminoids in the diet from the pretreatment period (table 1). Although forbs in the vegeta-

Table 1.--Food habits of elk as determined by fecal analysis

Year <sup>1</sup>	Scats Number	Grami- noids	Forbs	Sage- brush	Other browse
		- - - - -	- - - - -	- - - - -	- - - - -
1968	26	43.4	46.0	0.9	9.7
1969	20	33.0	46.0	1.0	20.0
1970	29	40.9	51.5	0.9	6.7
1971	25	34.4	56.9	0.0	8.7
Averages		37.9	50.0	0.7	11.3

<sup>1</sup>Area sprayed with 2,4-D in June 1969.



tion complex decreased from 44 percent before spraying to 26 percent after, the percentage of forbs identified in the feces increased an average of 8 percent following spraying. Sagebrush made up only a small percentage of the elk diet at this time of the year.

### Elk Calves

The calves spent an average of 3.4 and 5.5 hours on the spray area before and after treatment, respectively (table 2), which was not significantly different at any reasonable level. During feeding periods in 1968, calves were on the area to be sprayed twice as many hours as the adjacent area. Three very young calves spent 2 entire days on one spray site, which accounted for 21 of the 48 hours of feeding period observations. In the other years calves spent about equal time on the sprayed and adjacent sagebrush areas during the feeding periods. Standing dead sagebrush had no apparent adverse effects on the use of the area by elk calves. The more hours per feeding period in 1970 was due to heavy snow cover.

During the middle of the day, older calves spent considerably more time both before and after spraying in sagebrush areas with scattered conifer and aspen trees. The calves usually accompanied their mothers into the shaded areas to ruminate, especially on warm days. However, calves less than 3 days old usually bedded down on the warm, exposed slopes during the day, apart from their mothers.

### Adult Elk

The number of adult elk fluctuated considerably among years (66 to 38, table 2). Snow cover and plant development had the most influence on number of elk seen. The early seasonal development in 1969 and 1971 allowed elk to move across Dry Fork and west to the higher country. More elk were seen in Bull Elk Park these 2 years.

Our observations showed that elk graze at a slow walk. In the course of one feeding period they moved indiscriminantly over the entire study area without preference for timber or open sagebrush cover. We could not detect that their grazing habits were altered by the spray treatments. The animals did spend more time feeding where forage was most abundant and on the more gentle slopes.

The average hours of adult elk use per feeding period between sprayed and unsprayed areas in years of similar plant development and weather conditions were about the same. The late plant development in 1968 and 1970 would account for the higher average hours of elk use per feeding period on the lower areas near the spray site. Since there was considerably more acreage of unsprayed sagebrush control area within our view, it was natural that more hours of elk use were recorded on the unsprayed area, both before and after treatment. An analysis of variance showed no significant ( $F = 1.066$  at 95 percent level) difference in grazing hours of use due to effects of spraying sagebrush. The

Table 2.--Recorded adult and calf elk presence and use on treated area and on adjacent sagebrush area during feeding periods, 5:30-8:30 a.m., and 6:00-9:00 p.m.

Elk presence by treatment and year	Feeding periods	Animals sighted	Total time on area--		Time per feeding period on area--		Observed time on area--			
			Treated	Sagebrush	Treated	Sagebrush	Treated	Sagebrush		
CALVES ON AREA--			Number - -		Hours		Hours		Percent	
Before spraying:										
1968	10	6	48	24	4.8	2.4	67	33		
1969	19	6	42	44	2.2	2.3	49	51		
After spraying:										
1970	9	10	60	66	6.7	7.3	48	52		
1971	16	9	62	66	3.8	4.2	48	52		
ADULTS ON AREA--										
Before spraying:										
1968	10	66	331	476	33.1	47.6	41	59		
1969	19	46	273	664	14.4	34.9	29	71		
After spraying:										
1970	9	51	350	492	38.9	54.7	30	58		
1971	16	38	302	703	18.9	43.9	30	70		



averages of feeding for adult elk were 23.5 and 29.6 hours before and after spraying, respectively.

Adult elk spent about 2 hours feeding at each of the two feeding periods during daylight. The rest of the time was spent resting, ruminating, and playing. Since only about one-fourth of their time is spent feeding during daylight on open slopes, we found more pellet groups or fecal pies in or near the trees. Other studies (Boeker and Reynolds 1966, Pearson 1968, Reynolds 1969, Skovlin et al. 1968), have also shown fecal pellets more numerous near trees. Density and location of fecal droppings appear to be a poor index to elk feeding activity.

### Other Animals

Mule deer observed on the study area for the 4 years showed about the same feeding pattern before and after sagebrush spraying. They did not travel much while feeding, and remained closer to tree cover. Deer and elk were often seen feeding within a few feet of each other.

Black bears and coyotes were also seen on the study area. Elk showed more concern over the presence of coyotes than bears. In three cases cow elk with calves moved when coyotes were seen near. When black bears passed through the study area, the elk kept track of their location, but did not move out of the bear's way or show aggression. On one occasion a black bear passed within 30 feet of five grazing bull elk.

### Summary

Elk did not change their calving behavior or grazing activity patterns on a site where 96.7 percent of the big sagebrush cover was killed with 2,4-D herbicide. Analysis of fecal samples from the study site showed no large changes due to spraying in grass-forb ratios consumed. Feeding elk showed no indication they preferred to stay close to timber. Hence, it appeared that sagebrush control, if confined to limited and scattered areas, had no detrimental impact on elk during the calving period.

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